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The Sweet and Not-So-Sweet History of Saccharin

BY MISS CELLANIA NOVEMBER 24, 2016

When it was first introduced to the public, saccharin seemed to be a miracle. The substance is about 300 times as sweet as sugar, and it doesn't have any calories. What's not to love about that?

But not everything in saccharin's history is sweet. The story of the sugar substitute begins in the labs of Johns Hopkins University, where Dr. Ira Remsen became the first chemistry professor in 1876. One of his earliest laboratory residents was postdoctoral student Constantin Fahlberg, a Russian chemist whom Remsen met when the H.W. Perot Import Firm hired both of them to research sugar impurities.

In 1878, Remsen and Fahlberg were working on various products derived from coal tar. One night that June, Fahlberg worked late in the lab and went home to his supper in a hurry, neglecting to wash his hands. The bread he ate was unusually sweet, and so was his drink. Even his napkin tasted sweet. Eventually Fahlberg realized that he was sipping his drink from an area of his cup that his fingers had touched. He tasted his thumb, and then ran back to the laboratory to work on the newly discovered "coal tar sugar," which he named saccharin.

Fahlberg and Remsen co-authored research papers on saccharin over the next few years, but Fahlberg struck out on his own when he obtained a German patent for the compound in 1884, followed by a series of American patents. Remsen was upset that Fahlberg applied for the patent on his own: He wasn't all that interested in the commercial production of saccharin, but felt it important that his contribution to the discovery be acknowledged. Remsen was especially incensed at how Fahlberg's account of the discovery neglected to even mention the lead researcher.

Fahlberg opened a saccharin factory near Magdeburg, Germany, and another in the U.S. While saccharin sold well enough to make Fahlberg a wealthy man, sales went mostly to food manufacturers who used it as an additive. Consumers bought saccharin, too, but not as much, since regular sugar was readily available and didn't have the metallic aftertaste of saccharin.

Saccharin had its fans, however—including one in the White House. Theodore Roosevelt was president when the Pure Food and Drug Act, designed to protect the public from food adulteration and unsafe ingredients, was passed in 1906. Harvey Wiley, the chief chemist for the USDA, was charged with investigating dangerous foods. But when he broached the subject of the safety of saccharin in 1908, he hit a sore spot with the president. Roosevelt's doctor had prescribed a sugar-free diet, and Roosevelt used saccharin in its place. Wiley described saccharin as "… a coal tar product totally devoid of food value and extremely injurious to health."

Roosevelt was insulted. His response: "Anybody who says saccharin is injurious to health is an idiot." The remark proved to be the end of the two men's personal relationship.

In 1912, the use of saccharin was banned in the manufacture of processed foods, but it was still sold to consumers as a stand-alone product. Diabetics and people wishing to lose weight regularly purchased saccharin—but when a sugar shortage caused a massive price increase during World War I, its use really exploded. The same thing happened during World War II.

Meanwhile, the question of saccharin's safety wasn't fully settled. In the 1950s, another sugar substitute calledcyclamate was approved for sale. A combination of cyclamate and saccharin proved very popular, in part because the cyclamate canceled out the bitter aftertaste of the saccharin. The new combination led to a boom in diet soft drinks, until two 1968 studies indicating that cyclamate caused bladder cancer in laboratory rats prompted the FDA to ban the sweetener.

A 1970 study showed some disturbing evidence of saccharin also causing bladder cancer in rats, and the substance was banned in 1977. This time, food manufacturers, lobbyists, and consumers immediately fought back, wary of losing their last artificial sweetener. The ban was soon changed to a warning, and labels were added to products that contained saccharin.

However, later studies showed that the increased incidence of bladder cancer was only applicable to rats, due to their particular biology. The results of the earlier studies were not transferable to humans. In 2000, saccharin was taken off the government's list of known carcinogens, and the warning labels were discontinued. While other sugar substitutes have since been developed, saccharin still remains one of the most popular. Sold under the brand names Sweet'N Low, Sweet Twin, NectaSweet, and others, it accounted for 70 percent of the world demand for artificial sweeteners as of 2001, with world sales totaling hundreds of millions of dollars.

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The Pursuit of Sweet

From lab accident to wonder drug to chemical has-been, saccharin's history tracks the rise of consumer consciousness, government regulation, and the uncertainties underlying scientific evidence. While changing food habits drove saccharin's rise, some lamented the threat to "natural" foods.

BY JESSE HICKS SPRING 2010

You see them in almost every restaurant: those small paper packets, blue, yellow, or pink, emblazoned Equal, Splenda, or Sweet'N Low. In a little over 50 years artificial sweeteners have become a ubiquitous part of the dining experience. Where diners once found a sugar bowl, they're now more likely to find a multicolored collection of single-serving chemicals.

One compound blazed a trail for other artificial sweeteners: saccharin. Three hundred times sweeter than sugar, with no apparent side effects, it was touted to consumers as the gateway to a world of sweetness without consequences. Over time the saccharin story grew more complicated; while the substance remained unchanged, perceptions of it have undergone almost alchemical shifts. In its 130-year history saccharin has been a laboratory accident, a wonder drug, a dangerous carcinogen, and a consumer cause célèbre.

The story of saccharin's rise, its long reign as king of the artificial sweeteners, and its eventual decline illustrates a central tension within the American consumer's psyche. When a company claims its product improves on nature, many consumers happily declare the product an example of scientific progress. Equally powerful, though, is the inclination toward skepticism—a wary eye for "faster, better, more" claims. From the beginning consumers and regulators wondered whether saccharin was too good to be true, whether its sweetness could truly be harmless. That underlying fear has never completely gone away despite the widespread use of artificial sweeteners today. The story of saccharin is a story of chemistry outside the lab, where things get complicated.

Discovery and Commercialization: The Early Years of Saccharin

Saccharin ($C_7H_5NO_3S$) was discovered in 1878 in the Johns Hopkins University laboratory of Ira Remsen, a professor of chemistry. At age 21 Remsen had graduated with honors from the College of Physicians and Surgeons at Columbia University, earning an M.D. He soon abandoned his medical career to pursue chemistry, first at the University of Munich, then at the University of Göttingen, where he studied with Rudolph Fittig and began research on the oxidation of toluene isomers.

In Fittig's lab Remsen also studied sulfobenzoic acids, eventually publishing 75 papers on these and related compounds, laying the groundwork for the discovery of benzoic sulfinide—saccharin. Remsen returned to the United States in 1876—bringing with him influential German ideas about chemistry education—and accepted a professorship at Johns Hopkins. There he continued his research on the oxidation of methylated sulfobenzoic acids and their amides.

In 1877 a Russian chemist named Constantin Fahlberg was hired by the H.W. Perot Import Firm in Baltimore. Fahlberg studied sugar, while H.W. Perot imported sugar. The company enlisted him to analyze a sugar shipment impounded by the U.S. government, which questioned its purity. H.W. Perot also hired Remsen, asking him to provide a laboratory for Fahlberg's tests. After completing his analyses and while waiting to testify at trial, Fahlberg received Remsen's permission to use the lab for his own research. Working alongside Remsen's assistants, Fahlberg found the lab a friendly place. In early 1878 Remsen granted Fahlberg's request to take part in the institute's research.

One night that June, after a day of laboratory work, Fahlberg sat down to dinner. He picked up a roll with his hand and bit into a remarkably sweet crust. Fahlberg had literally brought his work home with him, having spilled an experimental compound over his hands earlier that day. He ran back to Remsen's laboratory, where he tasted everything on his worktable—all the vials, beakers, and dishes he used for his experiments. Finally he found the source: an overboiled

beaker in which o-sulfobenzoic acid had reacted with phosphorus (V) chloride and ammonia, producing benzoic sulfinide. Though Falhberg had previously synthesized the compound by another method, he had no reason to taste the result. Serendipity had provided him with the first commercially viable alternative to cane sugar.

Remsen and Fahlberg published a joint article describing two methods of saccharin synthesis in February 1879. Though they specifically noted its taste—"even sweeter than cane sugar"—neither discoverer seemed interested in its commercial potential.

At least not initially. In 1884, after he had left Remsen's lab and without notifying his codiscoverer, Fahlberg applied for German and American patents on a new method for producing saccharin more cheaply and in greater quantities. Remsen had long disdained industrial chemistry, considering himself a man of pure science. In 1886, though, Fahlberg filed another set of patents, claiming to be the sole discoverer of "Fahlberg's saccharin." Remsen, who wanted recognition rather than money, immediately protested to the chemistry community.

With his newly patented production method Fahlberg set up shop in New York City, where he and one employee produced five kilograms of saccharin a day for use as a drink additive. Offered in pill and powder form, saccharin's popularity grew quickly. Doctors began to prescribe it to treat headaches, nausea, and corpulence. (Like sugar before it, saccharin became an all-purpose curative.) Canners used it as a preservative; diabetics used it to sweeten coffee or tea.

As saccharin use rose, consumers, regulators, and competitors began to question its supposed harmlessness. Fahlberg had tested saccharin in late 1882. After consuming 10 grams of the chemical, he waited 24 hours and experienced no adverse reactions. In fact, his body barely responded: almost the entire dose passed unmetabolized into his urine.

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But by 1906, in response to such food-industry horror stories as Upton Sinclair's *The Jungle*, Americans demanded government intervention. Thus Congress passed the Pure Food and Drug Act, the first attempt to regulate the nation's food supply.

Enforcement of the new law fell to the Department of Agriculture's Bureau of Chemistry and its head chemist, Harvey Washington Wiley. He had long crusaded to rein in what he saw as an out-of-control food industry. In 1908 Wiley proposed the first saccharin ban, taking his case straight to President Theodore Roosevelt.

Wiley's stature as a chemist and sugar expert should have carried the day. In his meeting with Roosevelt he argued that saccharin, as a coal-tar derivative, couldn't possibly be fit for human consumption—though at this point the scientific evidence remained inconclusive. A factory owner responded that his company had saved thousands of dollars by replacing sugar with saccharin. Wiley countered that saccharin threatened the health of everyone who consumed it. Roosevelt gruffly settled the matter, saying, "Anyone who says saccharin is injurious to health is an idiot. Dr. Rixey gives it to me every day." Regulatory science, in the form of Wiley, had

collided with industrial market priorities; the anecdotal evidence of a single influential consumer—President Roosevelt, whose personal physician had prescribed saccharin to help his patient slim down—had trumped both.

In the years to come this pattern would repeat itself. Uncertain science provoked regulatory action—dismaying major segments of industry and the public, while invigorating those who saw regulators as protectors of the public welfare. Industry and regulators each had their own scientists and often their own incompatible sets of scientific evidence. The notion of scientific consensus began to break down as questions of safety became more complicated; the relationship between industry and regulators grew antagonistic as medical evidence became less conclusive and more open to interpretation.

With scientific consensus on safety issues no longer tenable, regulations would be increasingly made in public, often by the public—those consumers who considered themselves just as capable of interpreting the evidence as the so-called experts. For saccharin this regulation by the public reached its apogee in the 1970s, but the pattern had established itself as early as 1908.

Saccharin suffered minor setbacks in the coming decades, but every time it emerged more popular than ever. As a check on Wiley's growing power and at the request of industrialists, in 1910 President Roosevelt created the Referee Board of Consulting Scientific Experts. The board's first task was to examine the effect of sodium benzoate and saccharin on human health. The board, chaired by Ira Remsen, declared saccharin harmless in small doses. The next year Wiley won a small victory. He argued that because of saccharin's ubiquity, average consumers would ingest more of the sweetener than allowed for by Remsen's scientists. From July 1912 food regulations would treat saccharin as an "adulterant," prohibiting its use in processed foods. Industry lawyers fought back, and regulators wavered. A March 1912 decision upheld the earlier ban but also declared the evidence for saccharin's harmfulness as weak. Instead, it argued against replacing sugar with saccharin because the former possessed food value while the latter did not. Of course, this point made saccharin immensely popular for dieters since it provided sweetness without calories. The pattern continued with interest groups fighting over the definition and consequences of "incontrovertible scientific evidence."

The ban on saccharin in processed food was the outcome of a bureaucratic stalemate between regulators and industry. No incontrovertible evidence proved saccharin harmful at regular doses. Both sides offered evidence to support their claims, and neither could agree on a common definition of "harmful." Because no objective test existed, any experimental data was by definition controversial.

Whatever its scientific merit, the prohibition had little effect on public perception. Though saccharin couldn't be used in processed food, it could be sold directly to consumers. When World War I caused a sugar shortage and consequent price spike, Monsanto, then the largest saccharin producer, took its case to the public in full-page ads, arguing that widespread use of saccharin could save the country millions of dollars. Price-conscious consumers responded, buying up saccharin tablets for 15 cents a box at local drugstores. When the war ended, saccharin use dipped as consumers returned to sugar. U.S. entry into World War II in 1941 provoked another sugar shortage, and saccharin returned as a sugar substitute. But post–World War II,

changing American eating habits meant saccharin soon became more than just an alternative sweetener.

The Rise of Saccharin and Scientific Controversy

Had saccharin remained merely a sugar alternative, important only to a relatively small number of diabetics and weight watchers during peacetime, it probably would not have caught the eye of government regulators and scientists. In the aftermath of World War II, though, saccharin production remained high. Fundamental changes in the American diet meant fewer people prepared meals at home, relying instead on preprocessed food. Presweetened products, often containing inexpensive saccharin—the output of an increasingly large food-processing industry—alarmed nutritionists, regulators, and health officials. While saccharin consumption increased, the debate over its safety was never truly settled. Science, to the public, had issued too many contradictory or inconclusive opinions, so when the decision about saccharin fell to individuals, most responded to their desire for a no-consequences sweetener.

Others, like Harvey Washington Wiley before them, were skeptical. A belief in the inherent healthiness of "natural" food led some people to decry the increasing artificiality of the American diet. Avis DeVoto, a friend of Julia Child and an editor at Alfred Knopf, remained unimpressed by saccharin, especially by its increasing use in cookbooks. In 1957 she wrote, "Desserts, of which there is a fat section, are incredible—sweetened with saccharine [sic] and topped with imitation whipped cream! Fantastic! And I do believe a lot of people in this country eat just like that, stuffing themselves with faked materials in the fond belief that by substituting a chemical for God's good food they can keep themselves slim while still eating hot breads and desserts and GUNK." DeVoto despaired, but also perfectly captured saccharin's appeal: sweetness without consequences.

Partly in response to growing unease among regulators and the public, Congress passed the Food Additives Amendment in 1958. In preparing its legislation Congress heard testimony from members of the scientific community. For the first time in connection with food additives, scientists used the c-word: cancer. Representative James J. Delaney, a Democrat from New York, pushed hard for the addition of language specifically outlawing carcinogens. In its final form the "Delaney Clause" required the U.S. Food and Drug Administration (FDA) to prohibit the use of carcinogenic substances in food. Seemingly uncontroversial at the time—who would support adding cancer-causing agents to food?—it later proved contentious. Legislators had disastrously underestimated the data necessary to definitively declare a substance carcinogenic.

The same year, the Cumberland Packing Corporation introduced Sweet'N Low, a mixture of saccharin and cyclamate, another artificial sweetener. The two chemicals balanced each other, with cyclamate blunting the bitter aftertaste of saccharin. Sweet'N Low arguably tasted more like real sugar, and those little pink packets brought artificial sweeteners into diners and coffee shops. Meanwhile, the use of artificial sweeteners continued to increase among weight-conscious consumers. Between 1963 and 1967 artificially sweetened soft drinks (Coca-Cola's Tab, for example) nearly tripled their market share, growing to over 10% of the soda market.

In 1882 Constantin Fahlberg had declared saccharin harmless because he suffered no adverse effects 24 hours after taking a single dose. Similarly, Harvey Washington Wiley's turn-of-the-century "poison squads" had declared a substance safe if the tester—a human guinea pig—remained healthy after ingestion. But post–World War II health science had begun investigating subtler, long-term effects. Research methodology had changed accordingly: studies observed a longer span of time, for example, and tried to control for a wider range of variables. Researchers shifted away from unstructured human testing toward animal testing that included control groups. Such research produced more and better data but increased complexity. No longer could a substance be labeled simply "poison" or "not poison." The results of these sophisticated tests demanded sophisticated interpretation.

In the late 1960s three trends converged: increasing government regulation in the food-processing industry, the rise of artificial sweeteners, and the growing complexity and sophistication of health science. One of the first results of this convergence was the ban on cyclamate. Two 1968 studies linked the chemical to bladder cancer. The FDA cited the Delaney Clause in recommending a ban, which was enacted the following year. That left only one artificial sweetener on the market: saccharin. In 1970 oncologists at the University of Wisconsin Medical School published the results of a clinical study showing a higher instance of bladder cancer among rats who consumed saccharin daily. Subsequent tests seemed to support the initial results, and in 1972 the FDA removed saccharin from the list of food additives "generally recognized as safe." Peter B. Hutt, chief legal counsel for the FDA, stated that, "If it causes cancer—whether it's 875 bottles a day or 11—it's going off the market."

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Saccharin producers and commercial consumers recognized the FDA's move as a precursor to an outright ban. Large chemical companies—Monsanto, Sherwin-Williams, and Lakeway Chemicals—began assembling their own evidence to oppose prohibition. Soda companies expected a painful financial hit, as did makers of diet food. But they also knew the process could take years, as the FDA ordered new tests, analyzed the data, and—crucially—responded to public and political pressure.

By 1977 a saccharin ban looked likely. The Cumberland Packing Corporation, which had presciently reformulated Sweet'N Low in the shadow of the cyclamate ban, vowed to fight any regulation. Marvin Eisenstadt, the president of the company, appeared on television and radio to argue his case. He denied the scientific validity of animal testing and declared access to saccharin a consumer right. He helped draft a two-page ad from the Calorie Control Council, the industry group he headed. The ad appeared in the *New York Times* explaining "why the proposed ban on saccharin is leaving a bad taste in a lot of people's mouths." The ad described the ban as "another example of BIG GOVERNMENT" and recommended action. "Fortunately, we can all conduct our own experiment in this matter. It's called an experiment in democracy. . . . Write or call your congressman today and let him know how you feel about a ban on saccharin."

In the week after the saccharin ban went into effect in 1977, Congress received more than a million letters. Marvin Eisenstadt and other public relations–savvy producers had turned the saccharin debate into a PR operation, and the public had responded. The Delaney Clause, as the FDA interpreted it, required a ban on any known carcinogen in the food supply. But the original legislation failed to account for the complexity of scientific data. The clause's premise of scientific consensus based on objective evidence and shared expertise no longer applied to the real world, if it ever had. Scientists couldn't agree on fundamental questions: What is a carcinogen? What daily dosage of a chemical might be reasonable for testing toxicity? Did the elevated risk of cancer in rats translate to an elevated risk in humans? Health science couldn't yet answer those questions definitively. But in the absence of incontrovertible scientific evidence, Marvin Eisenstadt could frame the debate as average citizens versus an encroaching big government.

The FDA understood the weakness of the existing laws and breathed a sigh of relief when, a week after the ban, Senator Ted Kennedy of the Senate Subcommittee on Health and Scientific Research moved to forestall the ban. The Saccharin Study and Labeling Act passed that year, declaring that all saccharin products would carry a warning label. It also imposed a two-year moratorium on any government action to remove saccharin from the market. More studies were needed, according to Congress.

In response, Sweet'N Low sales skyrocketed. Those sales included longtime buyers stocking up in case of a ban, but the free publicity also brought in new customers. By 1979, 44 million Americans used saccharin daily. Consumers voted with their dollars.

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Congress renewed the moratorium every two years until 2000, when a National Institute of Environmental Health Sciences (NIEHS) study declared the earlier research invalid. The high dosages of saccharin given to the rats were a poor analog for human consumption, as rat digestion works differently from that of humans. The NIEHS recommended that Congress repeal the Labeling Act, officially declaring saccharin safe for human consumption.

Finally, though, it wasn't government regulation that toppled saccharin from its throne as king of the artificial sweeteners—at least not directly. The threat of a saccharin ban led producers to research alternatives. While saccharin—300 times sweeter than sugar—languished in the shadow of a potential ban, a new generation of artificial sweeteners flourished. In 1965 aspartame, which is 200 times sweeter than sugar, was discovered; in 1976 sucralose—600 times sweeter; and in 2002 neotame—7,000 to 13,000 times sweeter than sugar. Today, saccharin, once the undisputed king of artificial sweeteners, lags behind its newer counterparts, replaced by the next sweetest thing.

Sweet and Sour: A History of Controversy

From the beginning Americans have had mixed feelings about artificial sweetness. Saccharin originally appealed to frugal consumers. As Americans became more diet conscious, it became the no-calorie alternative to sugar. Those weight watchers wanted sweetness without consequences and manufacturers obliged. Newer, sweeter compounds appeared in saccharin's wake.

But while eagerly embracing these improvements, many remain suspicious about chemicals in their food. Stores like Whole Foods Market, movies like *Super Size Me*, and books like Michael Pollan's *The Omnivore's Dilemma* exemplify the turn away from industrialized, processed food.

The organic-food movement revives a long-held suspicion about how our food reaches our dinner tables. It also evokes a suspicion of science, specifically the nightmare image of Frankenfood. When it comes to food, Americans want the benefits of scientific progress but without all that science: better, faster, more—but it has to be "all natural."

That contradiction has played a major role in the history of artificial sweeteners. All three "first-generation" sweeteners—cyclamate, saccharin, and aspartame—have been linked to negative health effects. Cyclamate, introduced in 1951, was banned in the United States in 1970. The cyclamate ban reinvigorated the debate over saccharin's safety, leading to the Saccharin Study and Labeling Act. And aspartame, introduced in 1981, was linked to a supposed increase in brain tumors.

In all three cases researchers later declared the products safe. But the debate over safety received much press attention, and suspicion about artificial sweeteners has seeped into the collective consciousness. A Google search for any of the recently developed artificial sweeteners—acesulfame-K, sucralose, alitame, and neotame—invariably yields Web pages devoted to "the truth" about these chemicals.

Some of these pages are well-intentioned, if often misinformed or simplistic. Others have less noble agendas. One example, thetruthaboutsplenda.com asks, "Do you know what your children are eating?" The site answers that "Splenda is not natural; it is a chlorinated artificial sweetener." True, depending on the definition of natural in use and certainly effective in raising consumer suspicions. And who is the unbiased party helping spread the truth about Splenda? The Sugar Association, representing sugar-beet and sugar-cane producers across America.

http://www.todayifoundout.com/index.php/2014/05/saccharin-discovered-accident/

THE ACCIDENTAL DISCOVERY OF SACCHARIN, AND THE TRUTH ABOUT WHETHER SACCHARIN IS BAD FOR YOU

May 21, 2014 Karl Smallwood 6 comments

Saccharin is noted as being the first artificial sweetener, outside of the toxic Lead(II) acetate, and the first product to offer a cheap alternative to cane sugar. Interestingly enough, like the Chocolate Chip Cookie, it was also discovered entirely by accident.

The chemical was discovered in 1878/9 in a small lab at Johns Hopkins University. The lab belonged to professor of chemistry and all around chemical boffin, Ira Remsen. Remsen was hired by the H.W. Perot Import Firm in 1877, primarily so that the firm could loan the use of his lab to a young Russian chemist and sugar-nerd, Constantin Fahlberg.

The H.W. Perot company wanted Fahlberg to test the purity of a shipment of sugar they'd had impounded by the US government using Remsen's lab. Fahlberg agreed and happily conducted the tests. After he'd finished, Fahlberg continued to work in Remsen's lab on various things, such as developing coal tar derivatives.

On the momentous day in question, after working in the lab, Fahlberg was at home about to tuck into his meal when he noticed that the bread roll he'd just taken a bite out of tasted incredibly sweet. After ruling out the possibility of the bread roll being made that way, Fahlberg came to the conclusion that he must have accidentally spilled a chemical onto his hands. Rather than immediately sticking his finger down his throat and throwing up, then rushing to a hospital, Fahlberg reportedly became positively excited at the thought of his new discovery. (Yes, the first non-toxic artificial sweetener was discovered because a scientist didn't wash his hands after getting chemicals all over them- not unlike how the effects of LSD were discovered.)
At this point, Fahlberg didn't know which of the many chemicals he'd been working with that day had caused the sweet taste he'd experienced. With no alternative in mind, he resorted to going back to his lab and tasting every chemical he'd left on his desk, FOR SCIENCE! (Note: Nobel Prize winner Barry J. Marshall once did something equally daring, FOR SCIENCE, when he chose to drink the bacteria he thought caused ulcers to prove that they did.)

In any event, Fahlberg eventually discovered the source of the sweet chemical, a beaker filled with sulfobenzoic acid, phosphorus chloride and ammonia. This deadly sounding cocktail had boiled over earlier in the day, creating benzoic sulfinide, a compound Fahlberg was familiar with, but had never had a reason to try shoving into his mouth before that day.

Fahlberg quickly penned a paper with Remsen describing the compound and the methods of creating it. Published in 1879, the paper listed both Remsen and Fahlberg as the compounds creators. However, just a few short years later, after realising the compound's massive commercial potential, Fahlberg changed his mind and when he patented saccharin in 1886, he listed himself as the sole creative mind behind it. Fahlberg had also applied for an earlier patent on a method of creating saccharin cheaply and efficiently in 1884.

There is no agreed upon consensus on who exactly came up with what in regards to saccharin; some sources say Remsen wanted to be listed as a co-discovered purely because saccharin was discovered in his lab. This is supported by the fact that it's noted that by the time Fahlberg came

onto the scene, Remsen was the president of John Hopkins University and was, thus, absent from lab most of the time. Others claim Remsen was instrumental in the discovery, supported by the fact that earlier in his life he had published many papers on sulfobenzoic acids. As for what Remsen had to say of the matter, "Fahlberg is a scoundrel. It nauseates me to hear my name mentioned in the same breath with him."

Regardless, Fahlberg's new artificial sweetener, advertised as a "non-fattening" alternative to sugar, was fairly successful right off the bat in the states, though it wouldn't be until sugar shortages in WWI that it would became a widespread hit.

For those of you who are curious, the body doesn't metabolise saccharin, meaning it has no caloric or nutritional value, unlike sugar. And for all you health conscious types- no, saccharin isn't dangerous to humans.

This may come as a surprise considering that starting in the 1970s, and as recent as a a little over a decade ago, the widespread belief was that it caused cancer. This was despite the fact that in 1974 the National Academy of Sciences performed a review of all the studies done on saccharin and determined that there was no sound evidence that saccharin was a carcinogen and that the only studies that claimed to show it was were flawed or otherwise ambiguous in their results.

One particular flawed study from the 1970s was nearly the final nail in the coffin of saccharin when the researchers found that saccharin could lead to bladder cancer in rats. This spurred the *Saccharin Study and Labeling Act of 1977*, which managed to thwart efforts to ban saccharin outright, instead simply getting it a severe warning label: "Use of this product may be hazardous to your health. This product contains saccharin which has been determined to cause cancer in laboratory animals."

The rats in the study did indeed have a high rate of bladder tumors. However, beyond any potential flaws in methodology, there is the obvious caveat that, while similar in some ways, rodents and humans aren't exactly the same (shocker); so further studies needed to be done to see if the same thing occurred in humans.

What was happening with the rats is that specific attributes in their urine (high pH, high proteins, and high calcium phosphate) was, combined with the undigested saccharin, causing microcrystals to form in their bladders. This led to damage of their bladder lining, which over time led to tumors forming as their bladders were continually having to be repaired.

Once the exact cause of the tumors was determined, exhaustive tests were done to see if the same thing was happening with primates. In the end, the results came up completely negative, with no such microcrystals forming.

Thanks to this, in 2000, saccharin was removed from U.S. National Toxicology Program's list of substances that might cause cancer. The next year, both the state of California and the U.S. Food and Drug Administration removed it from their list of cancer causing substances. In 2010, the Environmental Protection Agency concurred, stating that "saccharin is no longer considered a potential hazard to human health."

The 1970s wasn't the first time this compound came under fire. A much earlier and equally as unfounded panic occurred as a result of the *Pure Food and Drug Act of 1906*. Harvey Wiley, the director of the bureau of chemistry for the USDA, considered saccharin inferior to sugar and

lobbied hard against it, even going so far as telling President Teddy Roosevelt that "Everyone who ate that sweet corn was deceived. He thought he was eating sugar, when in point of fact he was eating a coal tar product totally devoid of food value and extremely injurious to health."

While he got the "totally devoid of food value" part correct, the latter "injurious to health" part wasn't actually backed by any vetted evidence at the time (or since).

Roosevelt, who ate saccharin regularly, stated, "Anybody who says saccharin is injurious to health is an idiot."

Needless to say, Wiley soon lost much of his credibility and his job.

Bonus Fact:

- Saccharin should technically be referred to as, "anhydroorthosulphaminebenzoic acid." Fahlberg picked something different for obvious reasons. The name chosen, saccharin, is derived from the word, "saccharine" meaning "of or resembling sugar." This ultimately derived from the Latin "saccharon," meaning "sugar," which itself ultimately derived from the Sanskrit "sarkara," meaning "gravel, grit."

Expand for References

- A Sweet Baltimore Discovery at Johns Hopkins University
- Saccharin – the oldest Sweetener Sweet'N Low, Sugar Twin
- The Pursuit of Sweet: A History of Saccharin
- Saccharin
- Etymology of Saccharin
- Harvey Washington Wiley
- Saccharin Study and Labeling Act of 1977
- Artificial Sweeteners and Cancer
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